



POWER ANALYSIS:

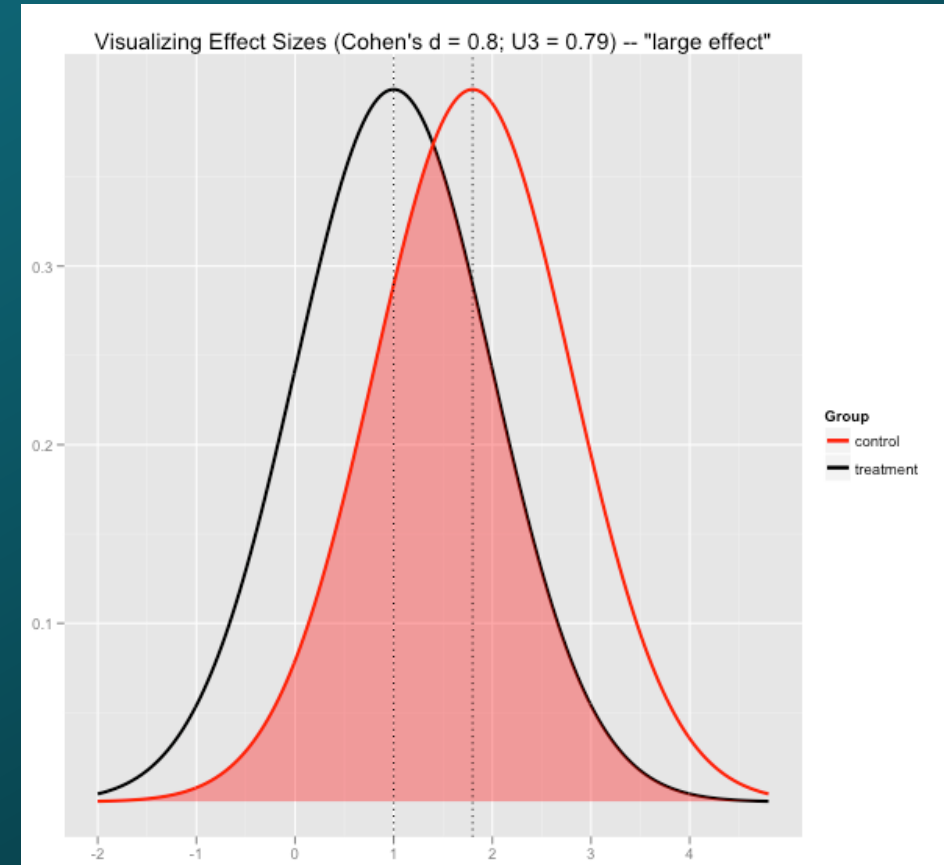
TOBACCO CESSATION TRAINING WITH MEDICAL PROFESSIONALS

Tiffany Munn

POWER ANALYSIS EXPLAINED

- What is it?
 - Probability that you reject the null hypothesis when you should
 - Power to detect true difference
 - Power 0.80 acceptable
- Power Calculation for 2 sample t-test
 - $H_0 : \mu_1 = \mu_2$
 - T = test statistic (old school charts)
 - Critical value t : what we see in the outputs
 - Critical region: Reject H_0 if $|T| > t$
 - Power = $1 - \beta = 1 - P(\text{type II error}) = P(|T| > t \mid H_0 \text{ false})$
 - Package in R: pwr
 - Free Software-GPower

EFFECT SIZE & COHEN'S D



$$\text{Cohen's } d = \frac{M_1 - M_2}{\sigma_{\text{pooled}}}$$
$$\text{where } \sigma_{\text{pooled}} = \sqrt{[(\sigma_1^2 + \sigma_2^2) / 2]}$$

Source: <https://rpsychologist.com/short-r-script-to-plot-effect-sizes-cohens-d-and-shade-overlapping-area>

PILOT STUDY

Training



N=212

10% of projected
study sample size



N=196

Completed all
pre questions



N=190

Completed all
post questions



N=71

Completed all follow-
up questions



Start

**Demographics &
Pre Test**

Post Test

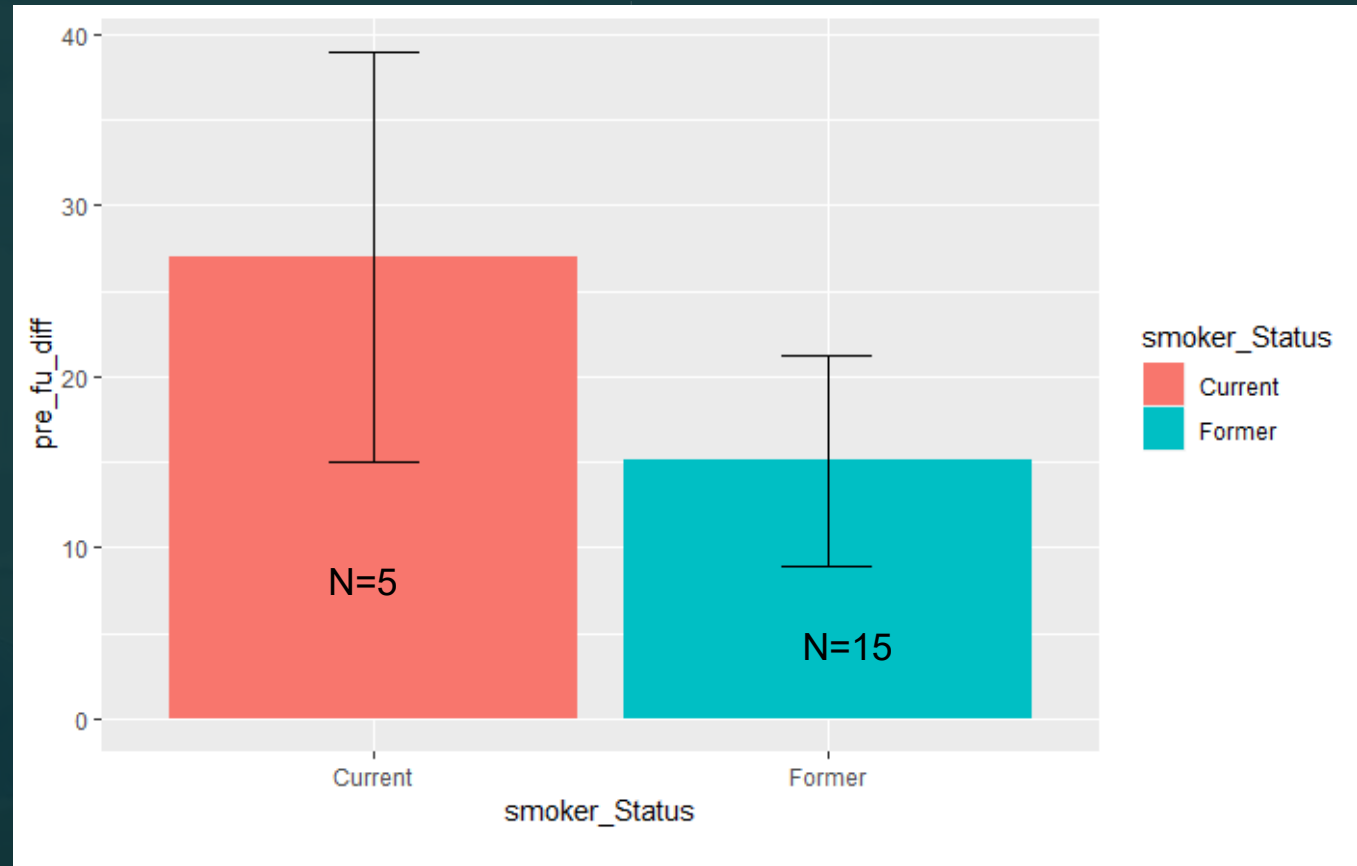
**6 mo. Follow-Up
Test**

POWER ANALYSIS ON WHAT ?



Do current smoker retain the same amount of knowledge from training than former smokers do?

- 2 sample t-test with unequal sample sizes
 - Measure: Difference KA Scores (Follow-up – Pre); higher better
 - Factor: Trainee Smoker Status (Current VS Former)
- Results
 - $t(10.65) = 1.43, p=0.1812$
 - Current Smoker Mean= 27.00
 - Former Smoker Mean =15.07



CURRENT SMOKERS ARE EXPENSIVE



How many current smokers do we need to obtain power at 80%

Observed Power Calculation

Observed Power=0.229

Sample size calculation for current smokers

Assume Former N= 135 (71% of sample)

Current Smoker N should be 21

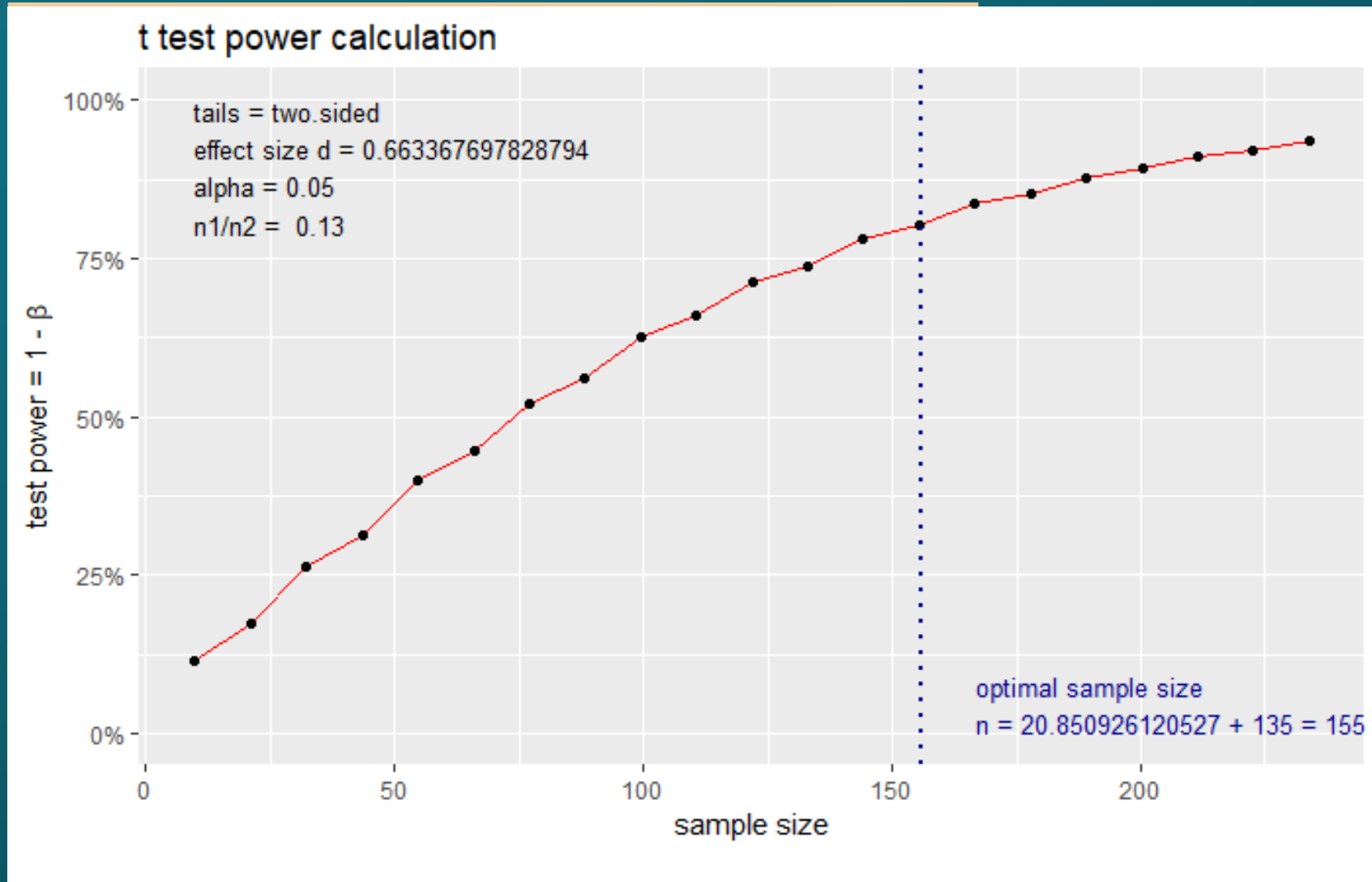
t test power calculation

```
n1 = 5
n2 = 15
d = 0.6633677
sig.level = 0.05
power = 0.2294062
alternative = two.sided
```

t test power calculation

```
n1 = 20.85093
n2 = 135
d = 0.6633677
sig.level = 0.05
power = 0.8
alternative = two.sided
```

VISUALIZING SAMPLE SIZE CALCULATION



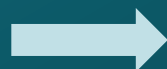
HOW ACCURATE WAS THIS?

Suppose we designed our actual study using these suggestions

Observed Power Calculation

Current
N=40

Former
N=125



t test power calculation

n1 = 40

n2 = 125

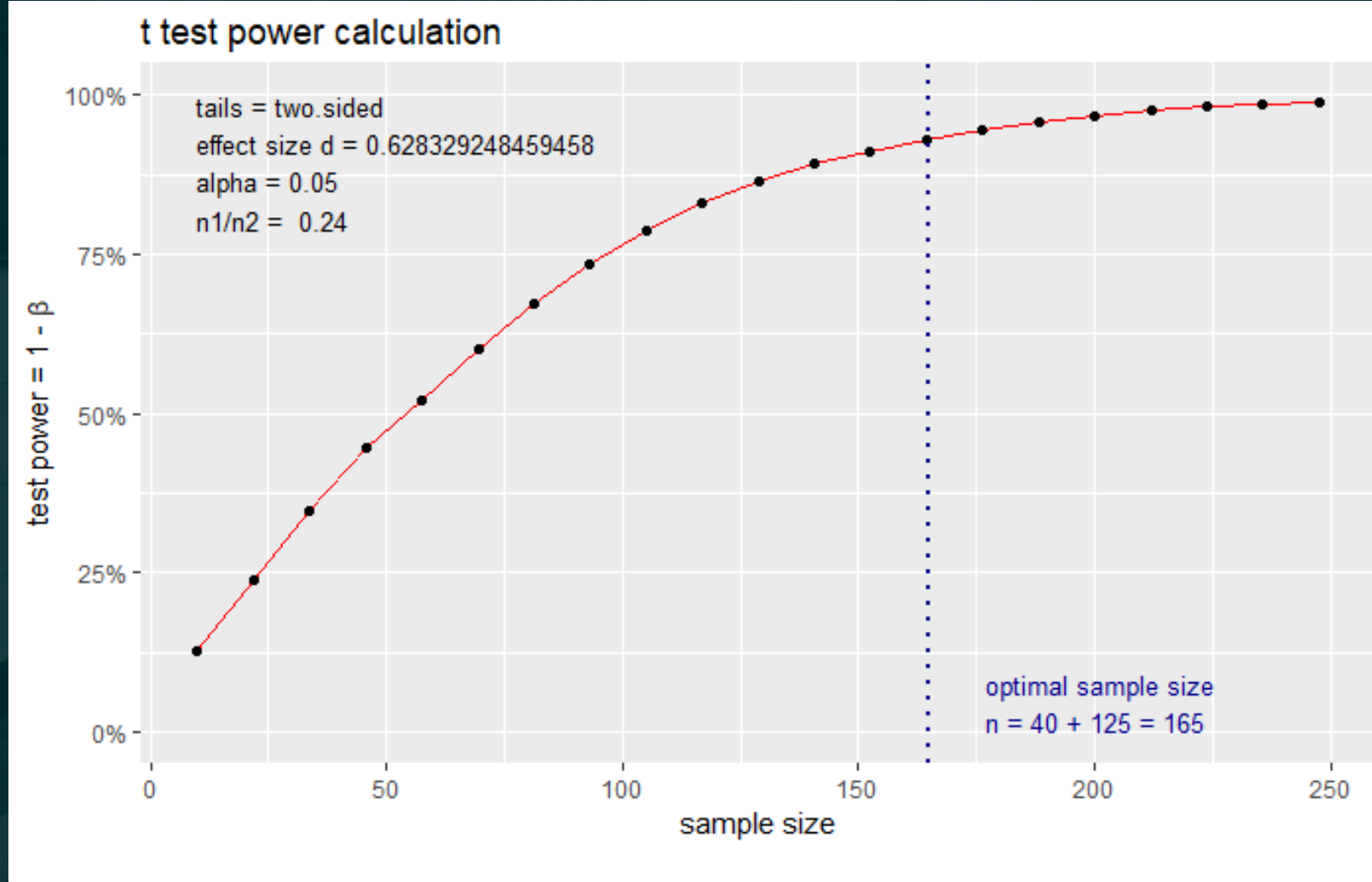
d = 0.6283292

sig.level = 0.05

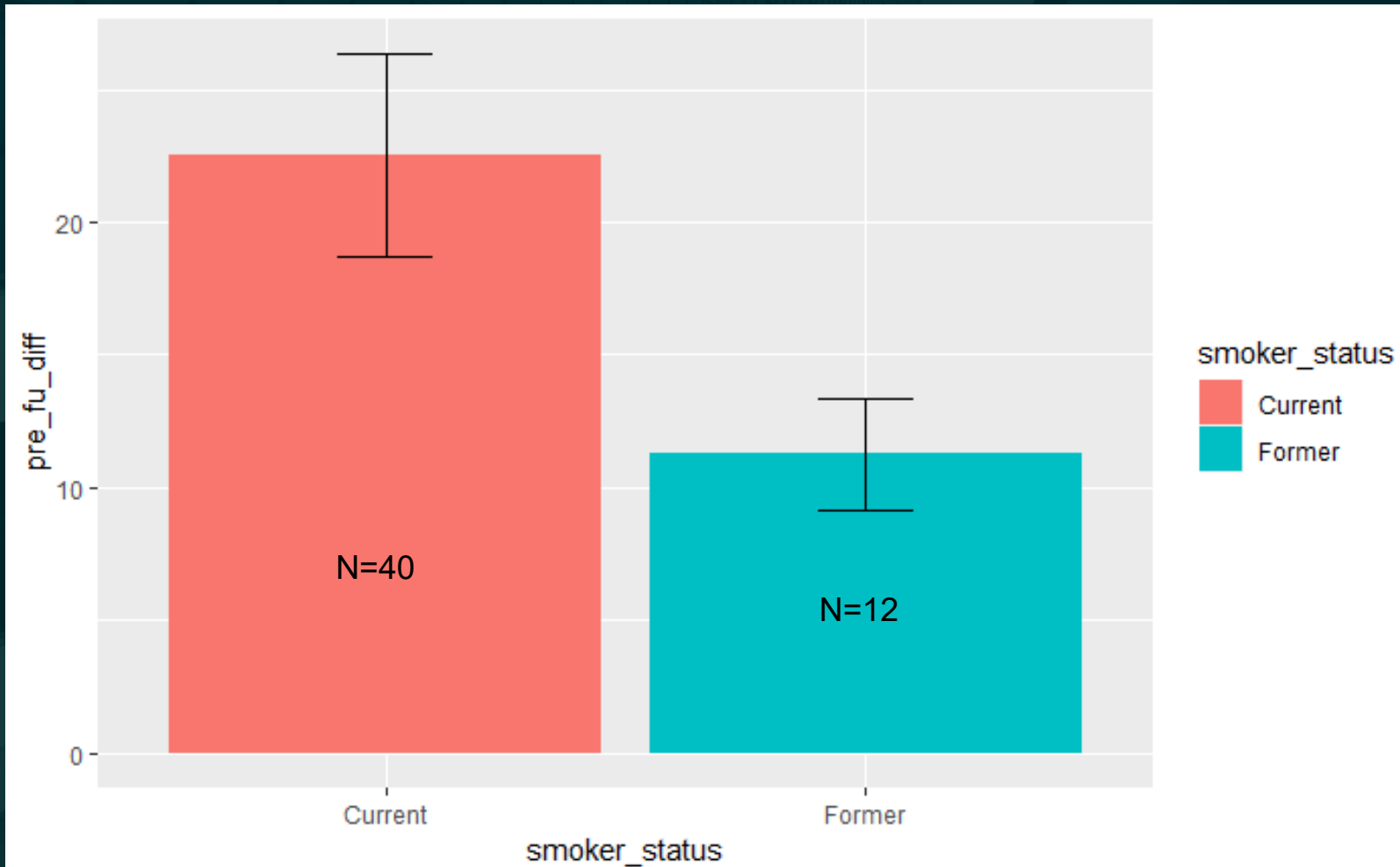
power = 0.9303529

alternative = two.sided

PRETTY ACCURATE!



T-TEST REPEATED WITH LARGER SAMPLE



$t(55.20) = 3.26, p < .01^{**}$

THANK YOU

Contact



Tiffany Munn

MS Candidate in Data Science at
the University of Denver



Tiffany.munn@du.edu

Study Info



Principle Investigator:
Christine Sheffer, Ph.D



Study Conducted:
University of Arkansas for Medical Sciences, 2010



Study Funding:
Pfizer, Inc.